

# Graphical Screen Design

**CRAP (contrast, repetition, alignment, proximity)**

**Grids are an essential tool for graphical design**

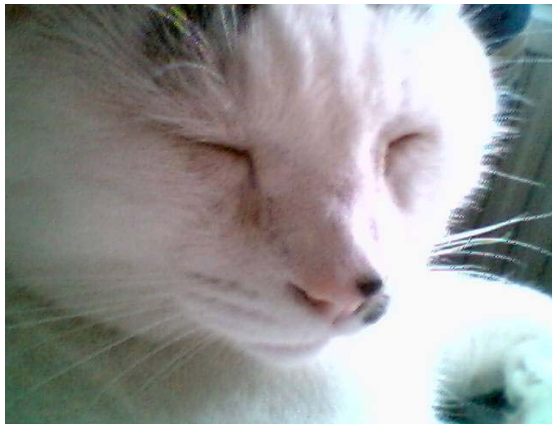
**Other important graphical screen design concepts**

- Visual consistency
- Visual relationships
- Visual organization
- Legibility and readability
- Navigational cues

James Tam

## The Squint Test

Used to determine what stands out or what elements appear to belong together



James Tam

## CRAP: An Important Tool For Graphical Screen Design

### Contrast

- Make different things even more different
- Brings out dominant elements
- Mutes lesser elements

### Repetition

- Repeat conventions throughout the interface to tie elements together
- Consistency

### Alignment

- Visually associate related elements by lining them up

### Proximity

- Group related elements
- Separate unrelated elements

James Tam

## Contrasting Contrast

**Laura Mathews**  
1993 Santa Rosa  
Santa Rosa, California 95403  
207.987.1234

**Related Skills**  
Excellent working knowledge of laboratory tests and their application in oncology care through working in a clinical laboratory, monitored while providing patient care. Assisted with basic nursing history and registration, further patient, presentation, theoretical, and practical chemotherapy administration. Promoted self-care skills and adaptation of the client to their disease and particular treatment program.

Extensive experience with at-home care of onc and cancer patients, including IV line maintenance, pain management, understanding of medication reimbursement and social service referrals.

**Education**  
1990 Associate in Science Nursing, High Honors  
Santa Rosa Junior College, Santa Rosa, California

**Experience**  
1992-present Registered Nurse for Home Health Plus, Visit Division. At-home care of patients with multiple health problems, onc, and cancer patients.

1990-present Registered Nurse for Memorial Hospital Oncology Unit, Santa Rosa, California. Managed the care of 4-5 oncology patients. Assisted lead nurse responsibilities. Assisted with new RN orientation. Assisted with procedures, administered chemotherapy, assessed for side effects of chemotherapy and disease process.

1985-1986 Nurse's Aide for Mendocino Coast District Hospital, Fort Bragg, California. Assisted with patient care in Med Surg and Obstetrics settings.

1983-1984 Lab Assistant for Mendocino Coast District Hospital, Fort Bragg, California. Computer skills while inputting data, cultured lab specimens.

**Personal Statement**  
Previous work experience in a fast-paced, high-stress environment has fine-tuned my organizational skills. My experiences have made me comfortable with oncology patients and their families. Supervisors value my organizational skills, respect for time and assume responsibility, and my dedication to my job.

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James Tam

## Repetition

### **Mickey Mouse**

- Walt Disney Studios  
Anaheim, California  
58 years old, no children

### **Employment**

- Walt Disney Studios
- Various television studios

### **Education**

- Walt Disney Studios

### **Favorite Activities**

- Driving steamboats
- Roping cattle

### **Favorite Quote**

- Everybody can't be a duck.

James Tam

## Alignment

### **Honor Form**

Heresy rheumatic starry offer former's dodder, Violate Huskings, an wart hoppings dam honor form.

Violate lift wetter fodder, oiled former Huskings, hoe batter repetition for bang furry ritch--an furry stretchy. Infect, simple orphan set debt Violate's fodder worse nosing button oiled mouser. Violate, honor udder hen, worsed furry gnats parson--jester putty ladle form gull, sample, morticed, an unaffiliated.

### **Tarred gull**

Wan moaning former Huskings mudst haze dodder setting honor cheer, during nosing.

"Violate" sorted dole former, "Watches setting dam far? Denture nor yore canned gat ritch setting darn during nosing? Germ pup offer debt cheer?"

"Am tarred, Fodder," resplendent Violate warily.

"Watches tarred far?" aster stretchy former, hoe dint half mush symphony further gull.

### **Feeder pegs**

"Are badger dint doe mush woke disk moaning! Ditcher curry dose buckles fuller slob darn tutor peg-pan an feeder pegs?"

"Yap, Fodder. Are letter pegs."



"Ditcher mail-car caws an swoop offer caw staple?" "Oll curse, Fodder. Are mukt offer caws an swapped offer staple, letter checkings, an clammed upper ladder inner checking-horse toe gadder

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"Ditcher mail-car caws an swoop offer caw staple?" "Oll curse, Fodder. Are mukt offer caws an swapped offer staple, letter checkings, an clammed upper ladder inner checking-horse toe gadder offer aches, an wen darn tutor vestibale guarding two peck offer bops

James Tam

## Proximity

CD ROMs  
CD ROMs  
Children's CDs  
Educational CDs  
Entertainment CDs  
Laser discs  
Educational  
Early learning  
Language arts  
Science  
Math  
Teacher Tools  
Books  
Teacher tools  
Videos  
Hardware &  
Accessories  
Cables  
Input devices  
Mass storage  
Memory  
Modems  
Printers & supplies  
Video and sound

**CD ROMs**  
CD ROMs  
Children's CDs  
Educational CDs  
Entertainment CDs  
Laser discs

**Educational**  
Early learning  
Language arts  
Science  
Math

**Teacher Tools**  
Books  
Teacher tools  
Videos

**Hardware & Accessories**  
Cables  
Input devices  
Mass storage  
Memory  
Modems  
Printers & supplies  
Video and sound

James Tam

## Grids

### Horizontal and vertical lines to locate window components

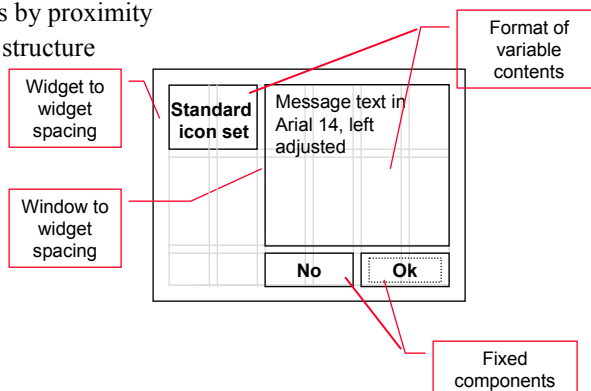
- Aligns related components

### Organization

- Contrast to bring out dominant elements
- Grouping of elements by proximity
- Show organizational structure
- Alignment

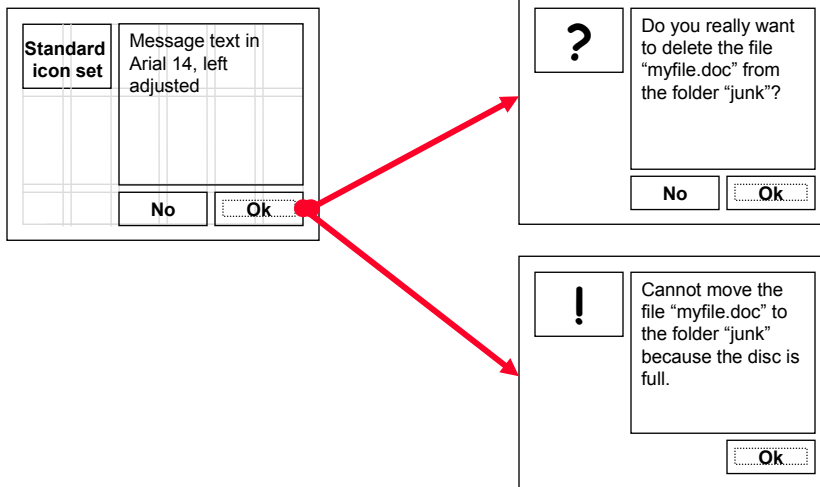
### Consistency

- Location
- Format
- Repetition
- Organization



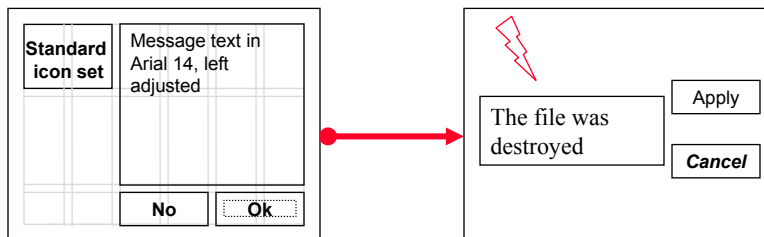
James Tam

## Uses A Grid: Consistent



James Tam

## No Grid: Inconsistent



James Tam

## Another Grid Example

The diagram illustrates the transition from a grid-based form to a functional application window. On the left, a window titled "Grid for Form Type 1" shows a grid layout with various form elements: a "Text field", a "Combo1" dropdown, a "Large multiline text field", and four "Check box" elements. A red box highlights the "Two-level Hierarchy" with sub-points: "•indentation" and "•contrast". A red arrow points from this grid to a "Note Sender" window on the right. The "Note Sender" window shows the same elements rendered in a functional interface: "Name" (Saul Greenberg), "Email" (saul@cpsc.ucalgary.ca), "Message" (Hi Saul, Lets get together for lunch, Perhaps tomorrow?, Judy), and "Instructions" (Type: Normal mail, Include attachments checked, Carbon copy unchecked). A red box highlights the "Logic of organizational flow" in the "Note Sender" window. Below the grid, a red box notes "Alignment connects visual elements in a sequence". To the right, another red box notes "Grouping by white space".

Two-level Hierarchy  
•indentation  
•contrast

Logic of organizational flow

Alignment connects visual elements in a sequence

Grouping by white space

James Tam

## Visual Consistency: Internal Consistency

- Unless there is a compelling reason all elements of the same program follow the same rules and conventions
- Application specific grids can be used to enforce this

A blue square is shown on the left. A red dashed line connects it to a "Doh!" label below it. Another red dashed line connects the blue square to the "Format AutoShape" dialog box on the right. The dialog box has tabs for "Colors and Lines", "Size", "Position", "Picture", "Text Box", and "Web". The "Colors and Lines" tab is active, showing options for "Fill" (Color: No Fill, Transparency: 0%), "Line" (Color: black, Style: solid, Dashed: none, Weight: 1 pt), and "Arrows" (Begin style, End style, Begin size, End size). A checkbox for "Default for new objects" is checked. "OK", "Cancel", and "Preview" buttons are at the bottom.

Doh!

Format AutoShape

Colors and Lines | Size | Position | Picture | Text Box | Web

Fill

Color: No Fill

Transparency: 0%

Line

Color: black Style: solid

Dashed: none Weight: 1 pt

Connector: none

Arrows

Begin style: none End style: none

Begin size: none End size: none

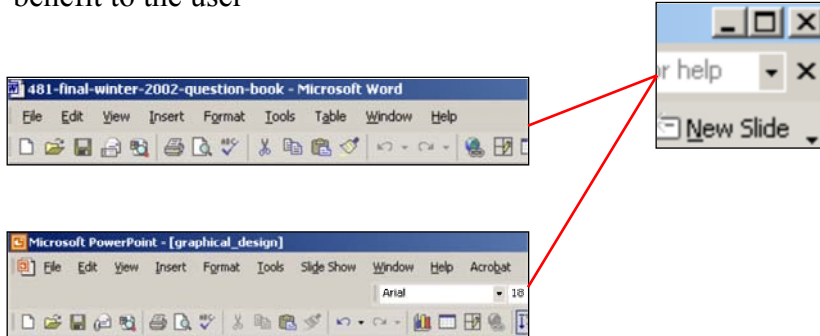
Default for new objects

OK Cancel Preview

James Tam

## Visual Consistency: External Consistency

- Follow interface and platform style conventions
- Use grids that are platform (e.g., Windows) and widget (e.g., Java Swing) specific
- Deviate from these conventions only when there is a clear benefit to the user



James Tam

## External Consistency Violated

The image shows a web interface for 'LIGANDFIT-SMALLPOX' with several sections. The 'Primary Task Information' section includes a title, a description, and a progress bar showing 96% completion. The 'Member Information' section displays 'Name: JimmyT', 'Total Points: 371477', and 'Total CPU Time: 2 years: 295 days: 11 h: 43 m: 17 s'. The 'Device Information' section shows 'Overall Performance' with a score of 100 and a comparison to a 'High-end Desktop System'. The interface uses a blue and white color scheme with various buttons and progress indicators.

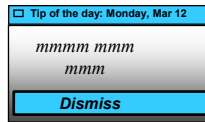
The UD agent © United Devices: www.ud.com

James Tam

## A Tool For Ensuring Consistency: Mumble Text



✓



✗

James Tam

## Relationships Between Screen Elements

- Using white space (negative proximity) vs. forcing an explicit onscreen structure (e.g., the use of frames)

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

✗

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

✗

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

Mmmm:

✓

James Tam



## Structure Is Difficult To Ascertain

*Placement* determines where the awareness information is located in the display. Awareness information has *situated* placement if the information is located in the part of the workspace where the event occurred, and it has *separate* placement if it is located somewhere else. Gutwin argues that situating awareness information takes advantage of a person's existing familiarity with the workspace, for it provides context. However, if many changes and events are taking place in the space over time then the potential downside is clutter leading to overload requiring increased effort to interpret the changes. Thus, some balance must be struck between context and overload.

The presentation dimension of Figure 4.1 classifies the display of awareness information as *literal* when it describes awareness information in the same form that it is gathered. In terms of change awareness this would mean that all the details about changes would be shown. It is *symbolic*, when only a subset of the information about a workspace event is displayed (Gutwin 1997). While a literal presentation may be easier to understand and interpret, in terms of change awareness, because of the potentially large amount of information that can accumulate as changes occur time an overly literal presentation may sometimes be more a nuisance than a benefit. This was found to be the case in my own investigation of potential change display mechanisms summarized in Chapter 5 and published as Tam, McCaffrey, Maurer, and Greenberg (2000). During this study, many test participants expressed a desire for useful abstractions that combine rudimentary change information into one higher-level conceptual change. For example, one participant noted while watching the animated replay of a class name being shown, "...I don't need to see each and every character being typed just to see a name change!" Of course, care must be taken to make these abstractions understandable, e.g., by using already familiar representations or notations. This minimizes the cost of acquiring information while maximizing its benefits due to the added structure and organization.

Based upon my previous findings (to be discussed in Chapter 5), I add a third dimension, *persistence*, to Gutwin's classification. Persistence refers to how long the information is displayed (Figure 4.1 side pane). The display of information is *permanent* if it is always visible and *passing* if it only appears for a certain period. We noticed how study participants frequently complained when important information disappeared off the screen. Conversely, they also indicated that screen clutter might occur with the mechanisms that constantly displayed all changes. Thus, there's a need to classify change information according to how long it should stay visible. With permanent persistence, the effort needed to find changes i.e., the acquisition cost is low because the information is always there. Ideally, a person merely has to shift their gaze over to see the information. Because people can become accustomed to the occurrence of workspace events, they can also ignore things that do not interest them and pay closer attention to things that are of interest (Gutwin 1997).

James Tam

## Explicit Structure Imposed

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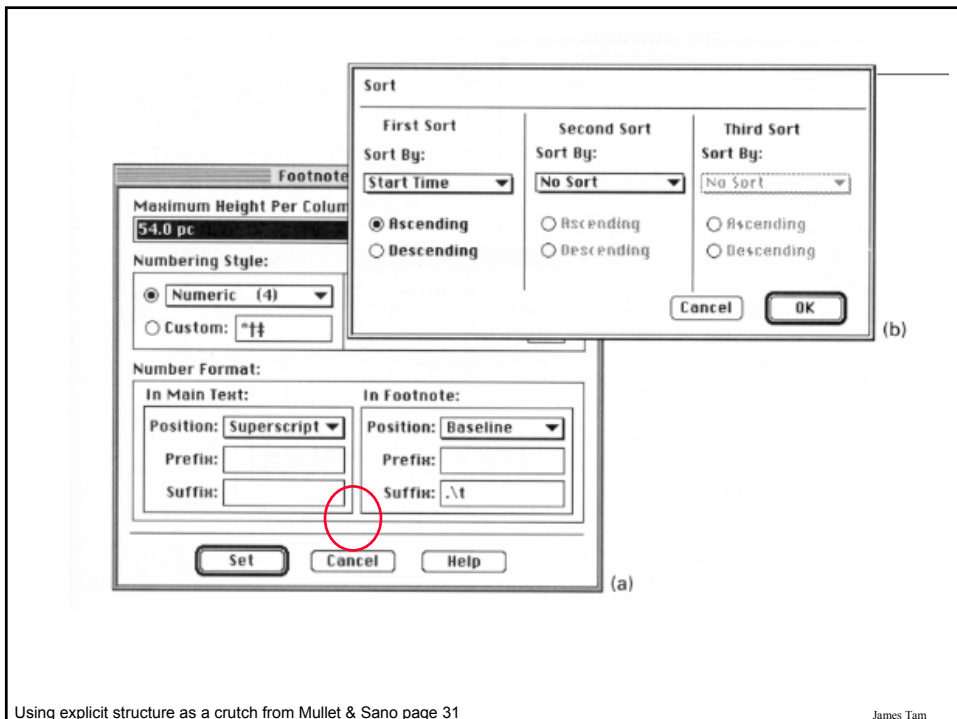
## Structure Implied With White Space

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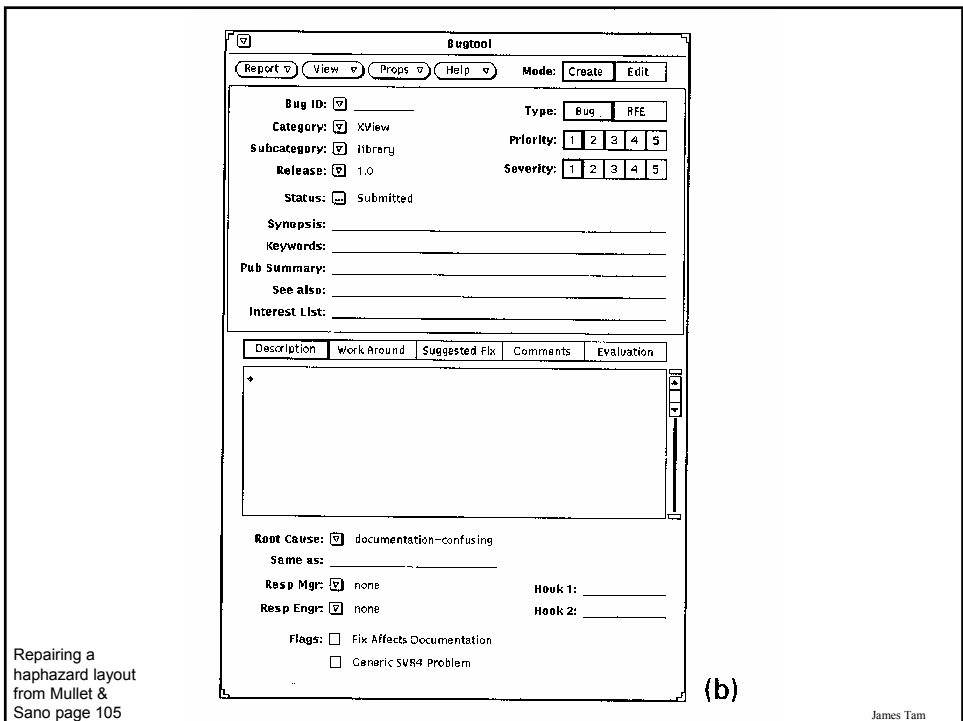
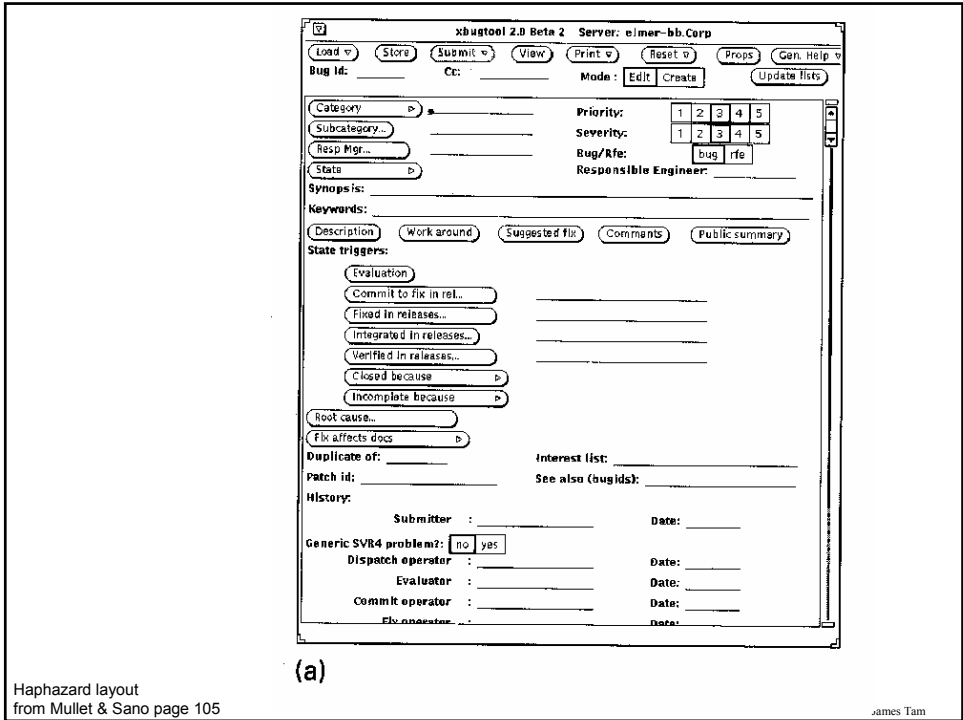
James Tam

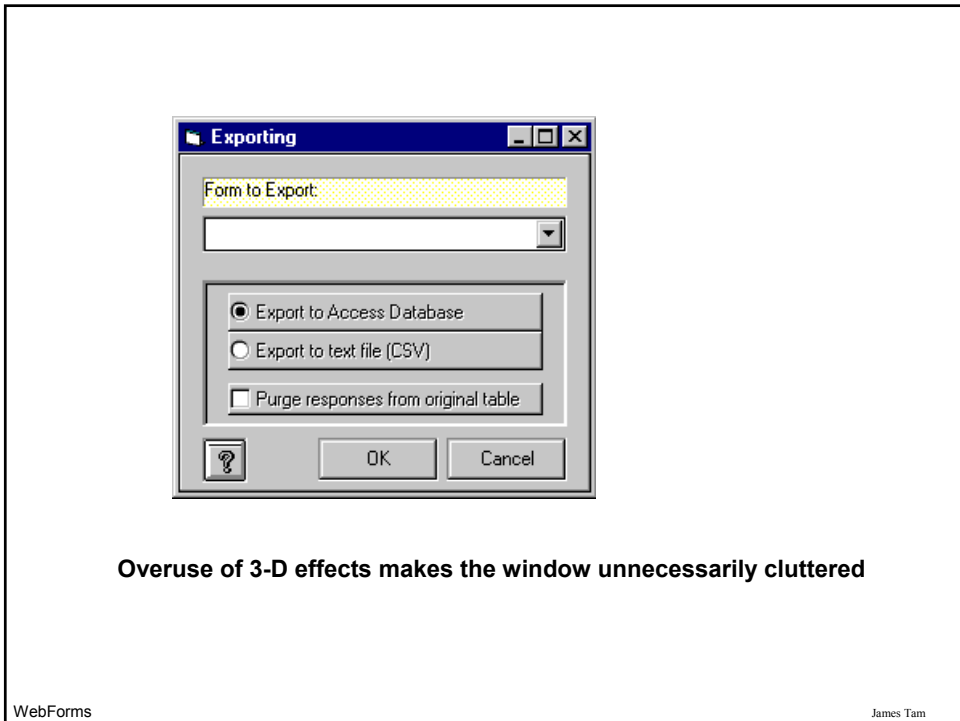
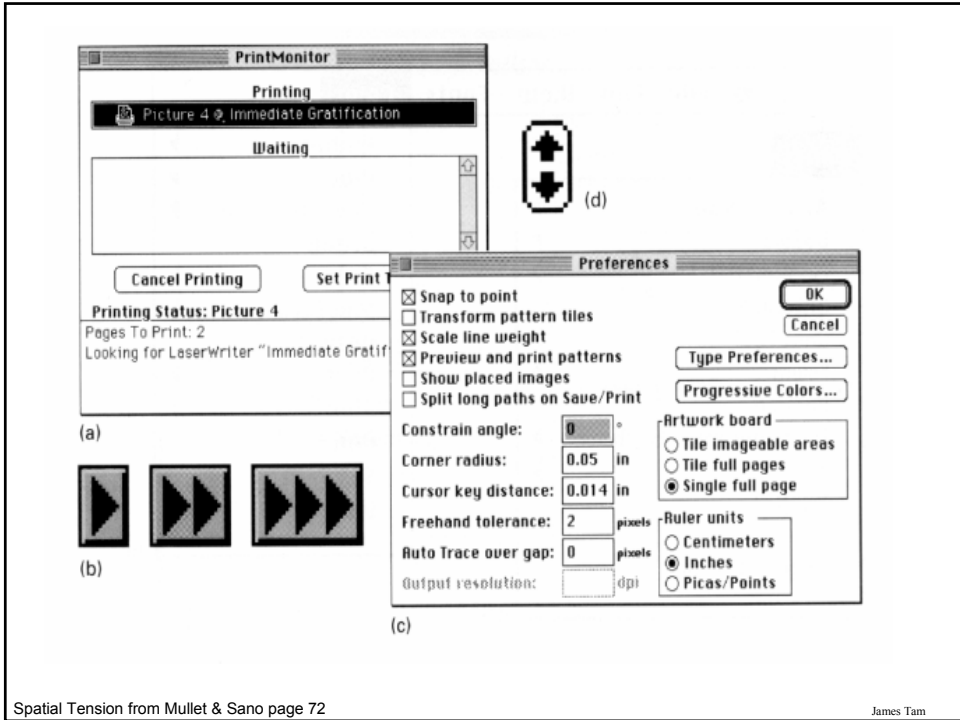


Form Title -- (appears above URL in most browsers and is used by WWW search)		Background Color:
Q&D Software Development Order Desk		FFFBF0
Form Heading -- (appears at top of Web page in bold type)		Text Color:
Q&D Software Development Order Desk <input checked="" type="checkbox"/> Center		000080
E-Mail responses to (will not appear on)	Alternate (for mailto forms only)	Background Graphic
dversch@q-d.com		
Text to appear in Submit button	Text to appear in Reset button	<input type="radio"/> Mailto
Send Order	Clear Form	<input checked="" type="radio"/> CGI
Scrolling Status Bar Message (max length = 200 characters)		
****WebMania 1.5b with Image Map Wizard is here!****		
<input type="button" value="Prev Tab"/>		<input type="button" value="Next Tab"/>

**Bad alignment**  
**Poor choice of colors to distinguish labels from editable fields**

No regard for  
order and  
organization

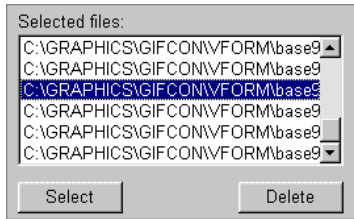




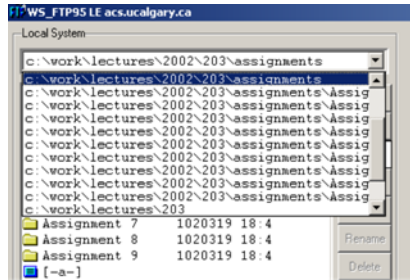
**Overuse of 3-D effects makes the window unnecessarily cluttered**

## Relationships Between Screen Elements

How do you choose when you cannot discriminate screen elements from each other?



GIF Construction Set

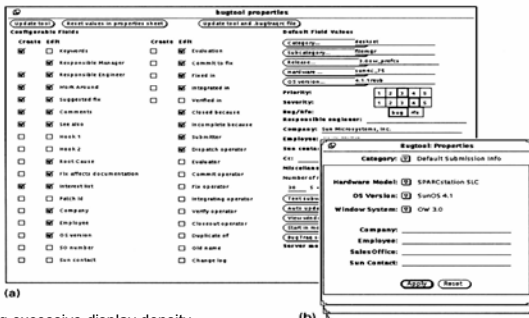


WS-FTP

James Tam

## Economy Of Visual Elements

- Minimize number of controls
  - Eliminate, or relegate others to secondary windows
- Include only those that are necessary
  - So information is not hidden
  - Combine redundancies

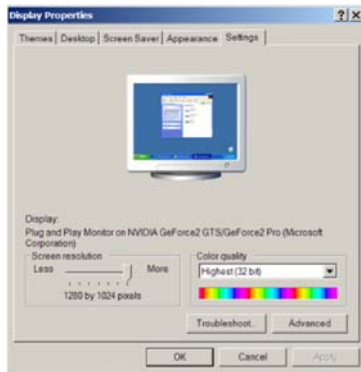


Repairing excessive display density  
from Mullet & Sano Page 111

James Tam

## Economy Of Visual Elements (Tabs)

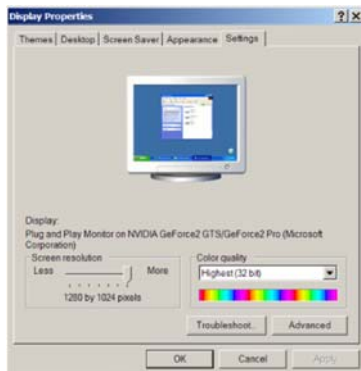
Excellent means for factoring related items



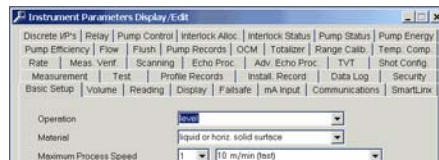
James Tam

## Economy Of Visual Elements (Tabs)

Excellent means for factoring related items

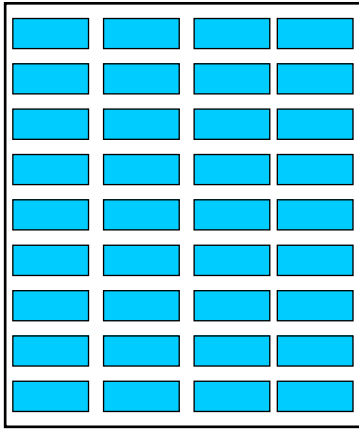


But it can be overdone

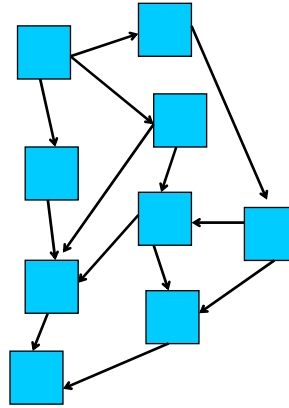


James Tam

## Balance Between Too Many Controls On A Single Screen Vs. Too Many Screens



x

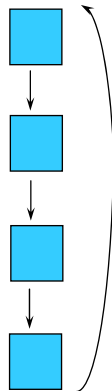


x

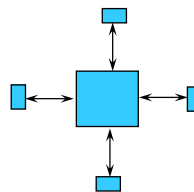
James Tam

## Widgets And Complexity

- How can window navigation and clutter be reduced?
  - Avoid long paths
  - Avoid deep hierarchies
  - Re-factor/combine functions



x



✓

James Tam



## Legibility And Readability

*Whenever your local SMS Administrator sends you an actual software Package, the SMS Package Command Manager will appear (usually at network logon time) displaying the available Package(s). The following screenshots display scenes similar to what you will see when you receive an actual SMS Package.*

*To start the demonstration, click the "CLICK HERE" button of the screen.*

## Legibility And Readability

If you wish to add/change network information, please select one of the following options.

- I WANT TO CONNECT TO AN EXISTING TIME & CHAOS WORKGROUP OR MODIFY THE CONNECTION SETTINGS.
- I WANT TO BUILD A BRAND NEW WORKGROUP.

These choices must be really important, or are they?

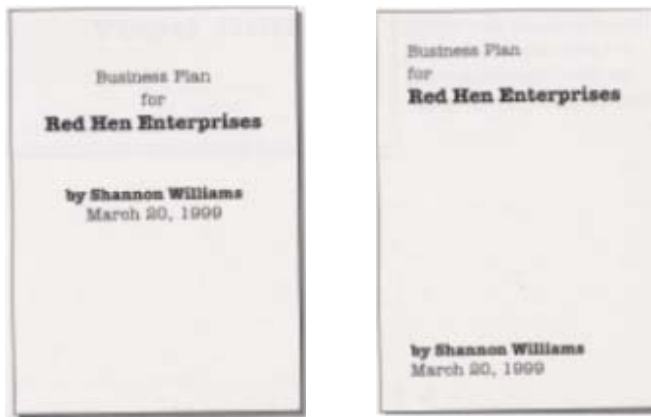
## Upper Case Text

THIS IS AN EXAMPLE OF TEXT THAT IS SHOWN ALL IN CAPITAL LETTERS. AS YOU CAN PROBABLY TELL, THE LACK OF VARIATION IN HEIGHT MAKES IT SOMEWHAT MORE DIFFICULT TO READ. THIS WHOLE PARAGRAPH JUST GOES ON AND ON WITHOUT SAYING ANYTHING SIGNIFICANT. THE OTHER SIDE EFFECT OF ALL CAPITALS IS THAT SOME PEOPLE THINK THAT IT IS THE TEXT EQUIVALENT OF SHOUTING AT SOMEONE. ALSO OTHER PEOPLE MAY THINK THAT IT IS MORE SIGNIFICANT BECAUSE IT IS ALL IN CAPITALS. THAT IS PROBABLY WHY SOME PEOPLE DO IT - IN ORDER TO GIVE THE IMPRESSION THAT THEIR MESSAGE IS REALLY IMPORTANT. BUT AS YOU HAVE PROBABLY ASCERTAINED (ASSUMING THAT YOU HAVE EVEN READ THIS FAR) THAT PUTTING TEXT ALL IN CAP'S IS SIMPLY TOO PAINFUL TO READ.

James Tam

## Center Alignment

- Some regard it as unprofessional and advocate against it's use.
- It's described as being unprofessional looking and plain.

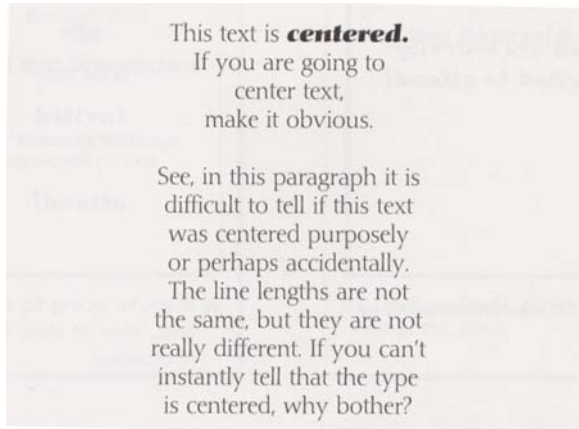




## Center Alignment



- **If you are employing it provide contrast then make it obvious**



## What You Now Know

**Grids and C.R.A.P. are essential tools for graphical design**

**Important visual concepts include**

- Visual consistency
  - Repetition
- Visual organization
  - Contrast, alignment and navigational cues
- Visual relationships
  - Proximity and white space
- Legibility and readability

# Interface Design and Usability Engineering

